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10/566,932	02/02/2006	Alexandre Ribeiro Dias	CML01134EP	9852

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EXAMINER	
PEREZ, JAMES M	
ART UNIT	**PAPER NUMBER**
2611	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

Docketing.US@motorola.com

Office Action Summary	Application No.	Applicant(s)	
	10/566,932	RIBEIRO DIAS ET AL.	
	Examiner	Art Unit	
	JAMES M. PEREZ	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 February 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *17-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *17-29 and 31-32* is/are rejected.

7)☒ Claim(s) *30* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 February 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Detailed Action

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 18-28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claims 18-28 are indefinite since said claims are dependent on claim 07, wherein claim 07 has been cancelled. The examiner will interpret any claim which directly depends on claim 07 to be dependent on claim 17.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 17-18, 20-21, 29, and 31-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ma (US 2002/0041635) in view of Yang et al. (USPN 7,072,289) further in view of Larrson (US 2002/0118771).

With regards to claims 17 and 31-32, Ma teaches a transmitter and method of communication using Orthogonal Frequency Division Multiplexing ('OFDM') from a transmitter (fig. 1: paragraphs 26-28) comprising a plurality of transit antenna means

(fig. 1: paragraphs 26-28) and a receiver comprising at least one receive antenna means (fig. 7: paragraphs 40-43), the transmitter and method comprising:

generating bit streams (fig. 1: paragraphs 26-28) and corresponding sets of N frequency domain carrier amplitudes (fig. 1: paragraphs 26-32: in the case where N is greater than or equal to 1) (s(kN + j), $0 \leq j \leq N-1$) modulated as OFDM symbols subsequently to be transmitted from a transmitter (fig. 1: paragraphs 23 and 26-32), where k is the OFDM symbol number (fig. 1: paragraphs 23 and 26-32) and j indicates the corresponding OFDM carrier number (fig. 1: paragraphs 23 and 26-32);

inserting affix information into guard intervals between consecutive time domain OFDM blocks (paragraphs 23 and 26-32);

the receiver removes unneeded cyclic extensions (prefixes) from the received signals (fig. 7: elements 701 and 703: paragraph 47).

using pseudo noise training sequences (PN) to estimate the Channel Responses (H_{lm} between the l_{th} transmit and m_{th} receive antenna) of the transmission channels between said transmitter and said receiver (fig. 7: paragraphs 12, 37-43, and 48); and

using the estimated Channel Responses (H_{lm} between the l_{th} transmit and m_{th} receive antenna) to demodulate said bit streams in the signals received at said receiver (fig. 7: paragraphs 12, 37-43, and 48).

Ma does not explicitly teach three Limitations: Limitation 1) inserting affix information into guard intervals between consecutive time domain OFDM symbols; transmitting said time domain OFDM symbols including said affix information from said transmitter to said receiver; and estimating Channel Impulse Responses; Limitation 2)

using said affix information at the receiver to estimate the Channel Impulse Responses (H_{lm} between the l_{th} transmit and m_{th} receive antenna) of the transmission channels between said transmitter and said receiver; wherein said affix information is known to said receiver as well as to said transmitter, and is mathematically equivalent to a vector (c_D) that is common to said time domain OFDM symbols multiplied by at least first weighting factors ($\acute{\alpha}_k$) that are different for one time domain OFDM symbol (k) than for another; and Limitation 3) second weighting factors ($w_i(k)$) that enable one of said transmit antenna means (i) to be distinguished from another.

Limitation 1)

Ma discloses inserting affix information into guard intervals between consecutive time domain OFDM symbols prevents inter-symbol interference (ISI) (paragraph 5) for time domain OFDM symbol which are transmitted through the channel (paragraph 5).

One of ordinary skill in the art at the time of the invention would recognize the benefits of inserting affix information into guard interval, since such a modification has the benefits of preventing ISI in transmitted time domain OFDM symbols thus lowering error in the wanted signal.

Therefore it would be obvious to one of ordinary skill in the art at the time of the invention to modify the system and method of Ma with the transmission OFDM symbol with include affix information guard intervals stated above since such a modification has the benefits preventing ISI in transmitted time domain OFDM symbols thus lowering error in the wanted signal.

Furthermore, Ma discloses estimating the channel response vector in the frequency domain (fig. 7: elements 709 and 711: paragraph 48). One of ordinary skill in the art at the time of the invention would clearly realize that frequency channel response is the Fourier Transformation of the Channel Impulse Response. Therefore it would be obvious to one of ordinary skill in the art at the time of the invention to modify the known system and method of Ma and the known estimation of the frequency channel response in order to yield predictable results and benefits such a estimating a channel impulse response instead of a frequency channel response.

Limitation 2)

Yang teaches inserting affix information (PN) into guard intervals in an OFDM system (col. 1, lines 35-55);

using said affix information at the receiver to estimate the Channel Impulse Responses of the transmission channel between said transmitter and said receiver (col. 1, lines 35-55, col. 4, lines 8-40, and col. 5, lines 50-58);

wherein said affix information is known to said receiver as well as to said transmitter (col. 5, lines 35-57), and is mathematically equivalent to a vector (c_D) (fig. 2C: col. 3, lines 7-30) that is common to said time domain OFDM symbols multiplied by at least first weighting factors (col. 5, lines 35-57) that are different for one time domain OFDM blocks than for another (col. 5, lines 35-57).

One of ordinary skill in the art at the time of the invention would clearly recognize the benefits inserting affix pseudo noise into the guard interval between OFDM symbols since such a modification has the benefits of time, frequency, and phase

synchronization/estimation in the receiver, while enabling channel estimation, preventing ISI of the received signal, and decreasing the need for training symbols (PN) in the preamble (reducing overhead, increasing system throughput). Therefore it would be obvious to one of ordinary skill in the art at the time of the invention to modify the MIMO-OFDM system and method and PN training sequences of Ma with the teachings of Yang since such a modification has the benefits of time, frequency, and phase synchronization/estimation in the receiver, while enabling channel estimation, preventing ISI of the received signal, and decreasing the need for training symbols (PN) in the preamble (reducing overhead, increasing system throughput).

Limitation 3)

Larsson teaches an OFDM system which uses a weighting factors ($w_i(k)$) that enable one of said transmit antenna means (i) to be distinguished from another by modifying a common PN code wherein said modification is known at the receiver (fig. 3: elements 308 and 381-382: paragraphs 63-64, 71, and 73).

One of ordinary skill in the art at the time of the invention would clearly understand the benefits of multiplying a common vector (PN) with a weighting factor that enable one of said transmit antenna means to be distinguished from another, since such a modification has the benefits of increasing the receiver's ability to extracting individual channel estimations (the channel between one transmission antenna and one receiver antenna) from the composite channel, thus increasing the receiver's capability to mitigate unwanted channel effects (distortion, delay, and noise) (Larsson: paragraphs 70-71) and increase synchronization (in frequency, phase, and time) with the wanted

signal (Larsson: paragraphs 73-74). Therefore it would be obvious to one of ordinary skill in the art at the time of the invention to modify the OFDM system and method using PN training sequences as disclosed in Ma in view of Yang with the teachings of Larsson since such a modification has the benefits of increasing the receiver's ability to extracting individual channel estimations (the channel between one transmission antenna and one receiver antenna) from the composite channel, thus increasing the receiver's capability to mitigate unwanted channel effects (distortion, delay, and noise) (Larsson: paragraphs 70-71) and increase synchronization (in frequency, phase, and time) with the wanted signal (Larsson: paragraphs 73-74).

With regards to claim 18, Ma in view of Yang in further view of Larsson teaches the limitations of claim 17.

Ma does not explicitly teach said first weighting factors have pseudo-random values.

Yang teaches said first weighting factors have pseudo-random values (col. 5, lines 35-57).

One of ordinary skill in the art at the time of the invention would clearly recognize the benefits inserting affix pseudo noise into the guard interval between OFDM symbols since such a modification has the benefits of time, frequency, and phase synchronization/estimation in the receiver, while enabling channel estimation, preventing ISI of the received signal, and decreasing the need for training symbols (PN) in the preamble (reducing overhead, increasing system throughput). Therefore it would

be obvious to one of ordinary skill in the art at the time of the invention to modify the MIMO-OFDM system and method and PN training sequences of Ma with the teachings of Yang since such a modification has the benefits of time, frequency, and phase synchronization/estimation in the receiver, while enabling channel estimation, preventing ISI of the received signal, and decreasing the need for training symbols (PN) in the preamble (reducing overhead, increasing system throughput).

With regards to claim 20, Ma in view of Yang in further view of Larsson teaches the limitations of claim 17.

Ma does not explicitly teach said first weighting factors are deterministic and are known to said receiver as well as to said transmitter independently of current communication between said receiver and said transmitter.

Yang teaches said first weighting factors are deterministic (col. 3, lines 8-30) and are known to said receiver as well as to said transmitter (col. 5, lines 35-57) independently of current communication between said receiver and said transmitter (col. 5, lines 35-57).

One of ordinary skill in the art at the time of the invention would clearly recognize the benefits inserting affix pseudo noise into the guard interval between OFDM symbols since such a modification has the benefits of time, frequency, and phase synchronization/estimation in the receiver, while enabling channel estimation, preventing ISI of the received signal, and decreasing the need for training symbols (PN) in the preamble (reducing overhead, increasing system throughput). Therefore it would

be obvious to one of ordinary skill in the art at the time of the invention to modify the MIMO-OFDM system and method and PN training sequences of Ma with the teachings of Yang since such a modification has the benefits of time, frequency, and phase synchronization/estimation in the receiver, while enabling channel estimation, preventing ISI of the received signal, and decreasing the need for training symbols (PN) in the preamble (reducing overhead, increasing system throughput).

With regards to claim 21, Ma in view of Yang in further view of Larsson teaches the limitations of claim 17.

Ma does not explicitly teach said first weighting factors are communicated from said transmitter to said receiver.

Yang teaches said first weighting factors are communicated from said transmitter to said receiver (col. 3, lines 8-30, col. 5, lines 35-57, and col. 6, lines 24-45).

One of ordinary skill in the art at the time of the invention would clearly recognize the benefits inserting affix pseudo noise into the guard interval between OFDM symbols since such a modification has the benefits of time, frequency, and phase synchronization/estimation in the receiver, while enabling channel estimation, preventing ISI of the received signal, and decreasing the need for training symbols (PN) in the preamble (reducing overhead, increasing system throughput). Therefore it would be obvious to one of ordinary skill in the art at the time of the invention to modify the MIMO-OFDM system and method and PN training sequences of Ma with the teachings of Yang since such a modification has the benefits of time, frequency, and phase

synchronization/estimation in the receiver, while enabling channel estimation, preventing ISI of the received signal, and decreasing the need for training symbols (PN) in the preamble (reducing overhead, increasing system throughput).

With regards to claim 29, Ma in view of Yang in further view of Larsson teaches the limitations of claim 17.

Ma does not explicitly teach said second weighting factors take different values for each of said transmit antenna means so as to enable said physical channels to be distinguished.

Larsson teaches an OFDM system which uses a weighting factors ($w_i(k)$) that enable one of said transmit antenna means (i) to be distinguished from another by modifying a common PN code wherein said modification is known at the receiver (fig. 3: elements 308 and 381-382: paragraphs 63-64, 71, and 73).

One of ordinary skill in the art at the time of the invention would clearly understand the benefits of multiplying a common vector (PN) with a weighting factor that enable one of said transmit antenna means to be distinguished from another, since such a modification has the benefits of increasing the receiver's ability to extracting individual channel estimations (the channel between one transmission antenna and one receiver antenna) from the composite channel, thus increasing the receiver's capability to mitigate unwanted channel effects (distortion, delay, and noise) (Larsson: paragraphs 70-71) and increase synchronization (in frequency, phase, and time) with the wanted signal (Larsson: paragraphs 73-74). Therefore it would be obvious to one of ordinary

skill in the art at the time of the invention to modify the OFDM system and method using PN training sequences as disclosed in Ma in view of Yang with the teachings of Larsson since such a modification has the benefits of increasing the receiver's ability to extracting individual channel estimations (the channel between one transmission antenna and one receiver antenna) from the composite channel, thus increasing the receiver's capability to mitigate unwanted channel effects (distortion, delay, and noise) (Larsson: paragraphs 70-71) and increase synchronization (in frequency, phase, and time) with the wanted signal (Larsson: paragraphs 73-74).

5. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ma (US 2002/0041635) in view of Yang et al. (USPN 7,072,289) with Larrson (US 2002/0118771) as applied to claim 17 above, further in view of Murakami et al. (US 2003/0039322).

With regards to claim 19, Ma in view of Yang in further view of Larsson teaches the limitations of claim 17.

Ma in view of Yang in further view of Larsson does not explicitly teach said first weighting factors have complex values.

Murakami teaches pilot symbols are complex valued (paragraph 381).

One of ordinary skill in the art at the time of the invention would clearly recognize that pilots are a type of pseudo noise. Furthermore one of ordinary skill in the art at the time of the invention would clearly understand the benefits of complex pseudo noise

(PN) since such a modification has the benefits of increasing throughput of the transmitted signal while enabling channel estimation. Therefore it would be obvious to one of ordinary skill in the art at the time of the invention to modify the system and methods of 'Ma in view of Yang in further view of Larsson' with teachings of Murakami since such a modification has the benefits of increasing throughput of the transmitted signal while enabling channel estimation.

Allowable Subject Matter

6. Claims 22-28 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

7. Claim 30 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAMES M. PEREZ whose telephone number is (571)270-3231. The examiner can normally be reached on Monday through Friday: 9am to 5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on 571-272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/James M Perez/
Examiner, Art Unit 2611
12/5/2008
/Shuwang Liu/
Supervisory Patent Examiner, Art Unit 2611